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(54) **METAL ORGANIC FRAMEWORK—POLYMER MIXED MATRIX MEMBRANES**

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(57) **ABSTRACT**

Metal-organic framework (MOF)-polymer mixed matrix membranes (MOF-MMMs) have been prepared by dispersing high surface area MOFs (e.g. IRMOF-1) into a polymer matrix (e.g. Matrimid 5218). The MOFs allow the polymer to infiltrate the pores of the MOFs, which improves the interfacial and mechanical properties of the polymer and in turn affects permeability. Pure gas permeation tests show the incorporation of 20 wt-% of IRMOF-1 in Matrimid 5218 polyimide matrix results in 280% improvement in CO₂ permeability without a loss of CO₂/CH₄ selectivity compared to those of the pure Matrimid 5218 membrane. This type of MOF-MMMs has significantly improved gas separation performance with dramatically high CO₂ permeability (>35 barrer) and higher than 29 CO₂/CH₄ selectivity at 50° C. under 100 psig pressure, which are attractive candidates for practical gas separation applications such as CO₂ removal from natural gas.